ALUMINUM EXTRUDED SHAPE MATERIAL CONVEYOR

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- european:
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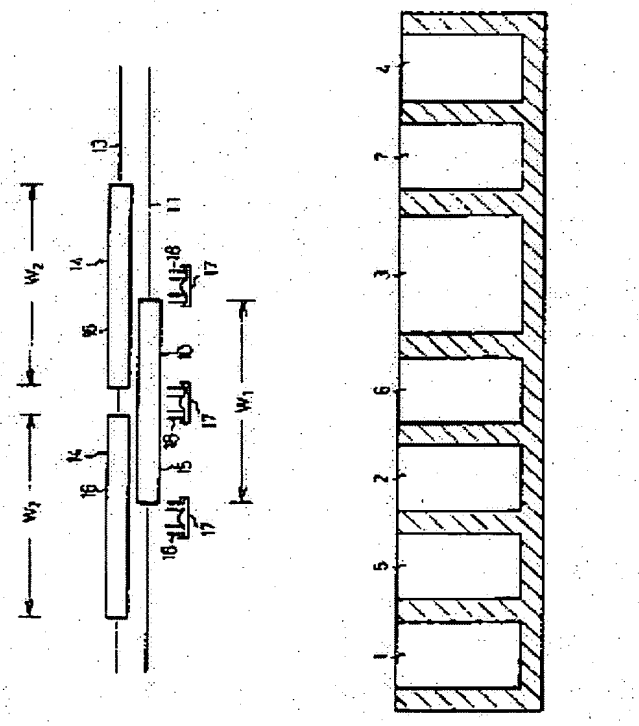
Abstract of **JP60213622**

PURPOSE:To increase a chance to convey aluminum extruded shape materials by arranging a separate crane track in parallel with a crane track equipped with the first single or multiple cranes and equipping this crane track with the second crane.
CONSTITUTION:When surface treatment is completed simultaneously at water washing tanks 5, 6 and an AC electrolytic tank 3, the first crane 10 and the second crane 14 approach these treating tanks 5, 6, 3 without coming into collision, and a mold frame 18 can be lifted via a jig 17, thereby aluminum extruded shape materials are immediately conveyed to the next process. Accordingly, the conveyance efficiency is improved as compared with the conventional aluminum extruded shape material conveyor.



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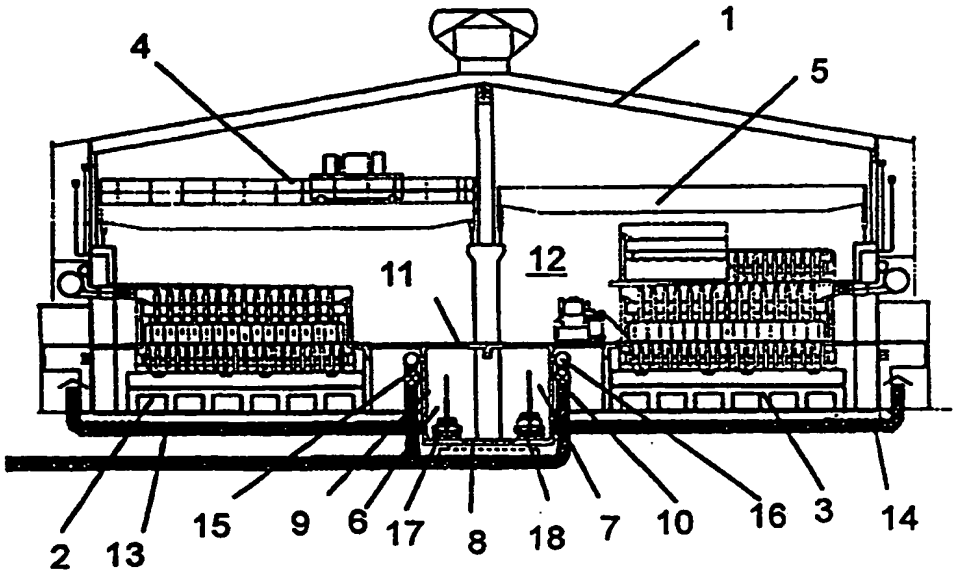
(54) Title: A PROCEDURE AND EQUIPMENT FOR HANDLING CARBON BODIES AND OTHER MATERIALS



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(57) Abstract

The present invention describes a procedure and equipment for handling and transporting objects such as carbon bodies and crust material in connection with electrolysis cells (2, 3) in an electrolysis plant (1), preferably for the production of aluminium. The plant may comprise several electrolysis cells arranged in one or more rows and the equipment may comprise at least one tunnel (6, 7) or a long, enclosed space for the transport of the objects to/from the cells. The tunnel is arranged parallel to the row of electrolysis cells and preferably at a level below the floor level (11) of the plant.

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A procedure and equipment for handling carbon bodies and other materials

The present invention concerns a procedure and equipment for handling carbon bodies and other materials in an electrolysis plant, preferably for the production of aluminium.

In connection with the production of aluminium in a plant comprising electrolysis cells in which so-called pre-baked anodes are used, the anodes will gradually be consumed and there is, therefore, a need to transport used anodes away from the cells and new anodes to the cells. Moreover, there is a need to transport away butts and material grabbed out of the cells.

With current technology, the anodes are removed with mechanical lifting equipment such as a traversing crane or a wheeled vehicle. An electrolysis cell may often have 20-30 anodes which are replaced in turn while the furnace is in operation in some plants. An anode is replaced after a period of approximately 20-30 days. A modern aluminium production plant may often comprise an electrolysis hall with several hundred electrolysis cells. Therefore, replacement work of anodes constitutes a major part of the activities in such a plant. It is, therefore, important that the logistics and transport systems in connection with such a plant are designed optimally.

When an anode is removed from the cell, it may typically have a temperature of 900-1000°C. Moreover, it may be accompanied by some melt and bath crust which has become attached to the anode or its suspension (yoke) and by material grabbed out of the bath melt. At such temperatures, the anodes and material grabbed out will give off fluorine gases and other pollutant, health-hazardous gases as well as dust into the atmosphere in the electrolysis hall while being transported away from the cell.

Moreover, manual or semi-automatic handling of the anodes requires extensive use of well-qualified personnel to achieve rational operation. Such handling of the anodes may also involve a certain risk of injury to personnel and equipment in the plant.

US 5,182,869 concerns equipment for cooling anodes which are removed from electrolysis cells. The purpose is to be able to more rapidly begin the work on cleaning the anode hangers for reuse in the suspension of new anodes. The equipment comprises a cooling chamber through which a belt conveyor passes, which transports the anodes through the chamber. The cooling chamber may be closed at both ends using doors and in the lower part of the chamber it is possible to add cooling air while an exhaust is arranged in the upper part of the chamber. The anodes may be placed on a pallet in the cooling chamber and inserted into and removed from the chamber using a fork-lift truck.

The cooling chamber may have an inlet which is located inside the electrolysis hall. However, the equipment will not solve in the transport-related problems inside the hall. Nor can it be seen that the equipment involves particular advantages with regard to the logistics inside the electrolysis plant. Further, the above solution will not solve the problems related to the emission of gases and dust into the hall atmosphere. This is because some used anodes must still be transported over long distances inside the plant, in particular anodes used in cells furthest away from the inlet of the cooling chamber.

The above problems can mainly be avoided with the present invention. The present invention will be described in the following using examples and figures, where:

Fig. 1 shows a cross-section of an electrolysis hall designed in accordance with the present invention,

Fig. 2 shows a side view of details of a lift device for use in connection with the present invention,

Fig. 3 shows a longitudinal section of a transport track with wagons,

Fig. 4a shows a top view of a traversing arrangement for the wagons of the transport track,

Fig. 4b shows a section through B-B in fig. 4a,

Fig. 4c shows a section through A-A in fig. 4a.

Figure 1 shows an electrolysis hall 1 comprising two parallel rows of electrolysis cells 2, 3. The rows each have a traversing crane 4, 5 to perform lifting operations in connection with work/maintenance on the cells. The cranes may be radio-controlled and are used in particular in connection with anode changes. Between the rows of cells and preferably at a level below them, two parallel cooling transport tunnels 6, 7 are arranged for the transport of anodes to/from the cells and material grabbed out of the cells. The tunnels each have a transport track 17, 18 which may comprise rails. Moreover, the tunnels are closed using a base 8, walls 9, 10 and a roof 11, and further communicate with the space 12 of the electrolysis hall using trapdoor devices arranged in the roof 11 of the tunnels, which here corresponds to the floor of the electrolysis hall. Moreover, the walls of the tunnel may have a system 13, 14 for supplying fresh air to its lower parts while an exhaust 15, 16 may be arranged in the upper parts for the removal of gases from the tunnels. The gas may expediently be conducted to a gas purification plant with heat recovery (not shown) before being released into the open air.

As shown in the figure, there is arranged one transport tunnel for each row of cells. The tunnels may also be linked to each other by means of openings defined between the support columns 40 of the hall, see figure 2. Trains comprising several wagons 41 may be arranged in the tunnels and run to predetermined locations in

the part of the electrolysis hall in which the carbon body replacement is to take place. The trains are preferably computer-controlled and controlled in accordance with a predefined computer program. The creation of such programs and the provision of the necessary equipment is something that the man skilled in the art will be familiar with and will consequently not be described further here. At a suitable distance from each transport tunnel, a trapdoor arrangement 42 is arranged in the floor beside each of the transverse cells where new anode carbon and butts with accompanying grabbed-out material can be raised/lowered from/to the transport tunnel. The trapdoor device may comprise two trapdoor halves 43, 44 which act in unison. Under each trapdoor there is a lift 45 which lifts transport cassettes 46 up through the trapdoor so that the lifting distance for the radio-controlled crane is minimised. Both the number and location of the trapdoors are arranged expediently so that the transport time for the used anodes and the crust material in the free spaces of the hall is reduced to a minimum to restrict the emission of gases into the hall atmosphere.

Grabbed-out material 80 from the cells may also be placed in separate transport containers 81 on the train, see figure 3. Moreover, the transport of anode carbon 82 consisting of a carbon body 84 and an anode hanger 83 is also shown. The transport containers may, in the same way as the anode carbon, be lifted up to the floor level of the electrolysis hall for loading of the material which is grabbed out of the cells.

Figure 4a shows a top view of a traversing arrangement for wagons which run through the tunnels. The traversing arrangement is expediently mounted at one end of the tunnels 6, 7 and comprises means which allow rational loading/unloading of the wagons of the trains. The tunnels may preferably be longer than the electrolysis hall. The traversing arrangement at one end of the tunnels and possibly an

equivalent system at the other ends of the tunnels (not shown) may be on the same level as the base 8 of the tunnels. The tunnels may be given a gentle incline so that the stated arrangement can be on a level with the floor 11 of the electrolysis hall 1. On the figure, the transport tracks 17, 18 are shown rather schematic and the wagons are served by a traversing wagon 100 which can be used to handle anode carbon 82 or transport containers 81. Moreover, the equipment may comprise a traversing crane 101 or a traversing wagon which can be used for loading/unloading carbon bodies. The crane or traversing wagon can also be used for handling transport containers.

Figure 4b shows a section through B-B in figure 4a and shows the traversing wagon 100 and the traversing crane 101.

Figure 4c shows a section through A-A in figure 4a and thus shows the traversing wagons 100 in a side view.

Within the framework of the attached claims, the present invention is not restricted by the above description of examples and figures. Thus the described rails and trains may be replaced by, for example, endless conveyors such as belt conveyors or hanging conveyors. Moreover, the described traversing arrangement may also be constructed in other ways, depending on the rest of the infrastructure in the plant.

Even though the present invention has been described in particular in connection with a pre-bake plant for the production of aluminium, it may also be applied in connection with electrolysis plants of other types.

The following advantages may be achieved with the present invention:

* There will be improvements in terms of Health, Environment and Safety in relation to current systems
* Replaces transport vehicles for handling anodes in the electrolysis hall
* Contributes to butts and grabbed-out material being removed as rapidly as possible from the hall atmosphere with a resulting severe decrease in fluorine emissions by up to approximately 50% in relation to conventional solutions
* The cooling/transport tunnel has direct exhaust to the gas purification plants
* The efficiency in connection with carbon changes will be very high as the whole operation in the electrolysis halls can be operated by one operator

Claims

1. A procedure for handling and transporting objects such as carbon bodies (84) and crust material (80) in connection with electrolysis cells (2, 3) in an electrolysis plant, preferably for the production of aluminium, where the plant comprises several electrolysis cells arranged in one or more rows,
characterised in that
the objects are transported to/from the cells through one or more tunnels (6, 7) or long, enclosed spaces which are preferably located below a floor level (11) in the plant.

2. A procedure in accordance with claim 1,
characterised in that
the tunnel (6, 7) is arranged in the plant in such a way and is designed with openings which are located in such a way that the transport time of the objects in the free spaces of the electrolysis hall is minimised.

3. Equipment for handling and transporting objects such as carbon bodies (84) and crust material (80) in connection with electrolysis cells in an electrolysis plant (1), preferably for the production of aluminium, where the plant comprises several electrolysis cells (2, 3) arranged in one or more rows,
characterised in that
the equipment comprises at least one tunnel (6, 7) or a long, enclosed space for transporting the objects to/from the cells and that the tunnel is arranged parallel with the row of electrolysis cells and preferably at a level below the floor level (11) of the plant.

4. Equipment in accordance with claim 3,
characterised in that
the tunnel communicates with the space (12) of the electrolysis hall by means of one or more trapdoors (42, 43, 44) arranged in the floor (11) of the hall and that the floor constitutes the roof of the tunnel.

5. Equipment in accordance with claim 4,
characterised in that
a lift (45) is arranged in connection with the trapdoor (42, 43, 44) to transport objects between the tunnel (6, 7) and the space (12) of the electrolysis hall.

6. Equipment in accordance with claim 3,
characterised in that
the tunnel (6, 7) is fitted with a transport track (17, 18) which comprises rails with a train consisting of one or more wagons (41).

7. Equipment in accordance with claim 3,
characterised in that
the tunnel (6, 7) is fitted with a transport track (17, 18) of an endless type such as a belt conveyor or hanging conveyor.

8. Equipment in accordance with claim 3,
characterised in that
a traversing arrangement is arranged at one end of the tunnel (6, 7) and comprises equipment (100, 101) for bringing objects to/from the transport track (17, 18).

9. Equipment in accordance with claim 3,
characterised in that
the tunnel (6, 7) or the long space has means (13, 14) for the supply of air and means of exhaust (15, 16) for the removal of gas and any dust.

10. Equipment in accordance with claim 9,
characterised in that
the means of exhaust (15, 16) comprise equipment for purifying gas and means for heat recovery.

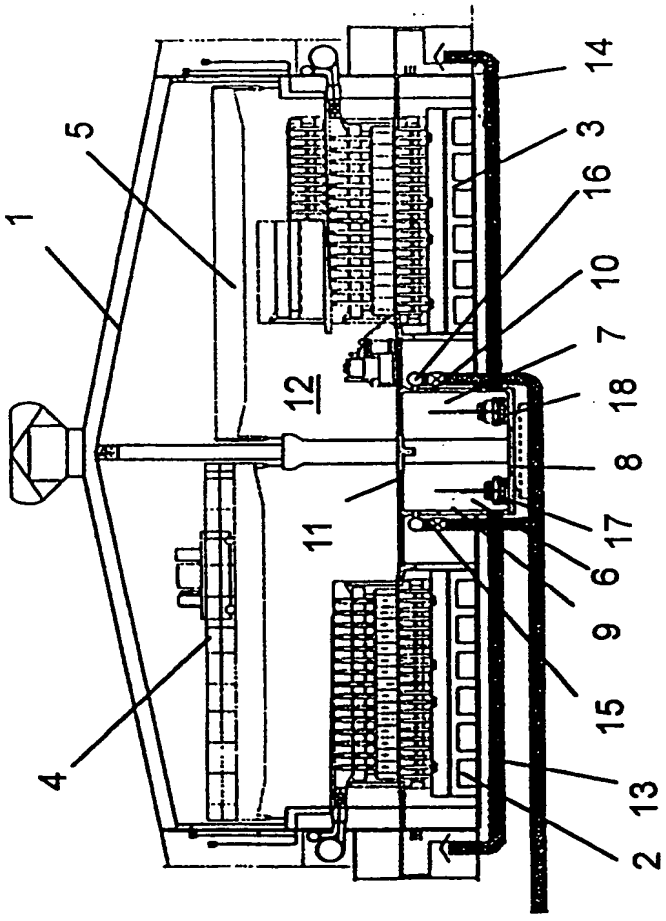

Fig. 1

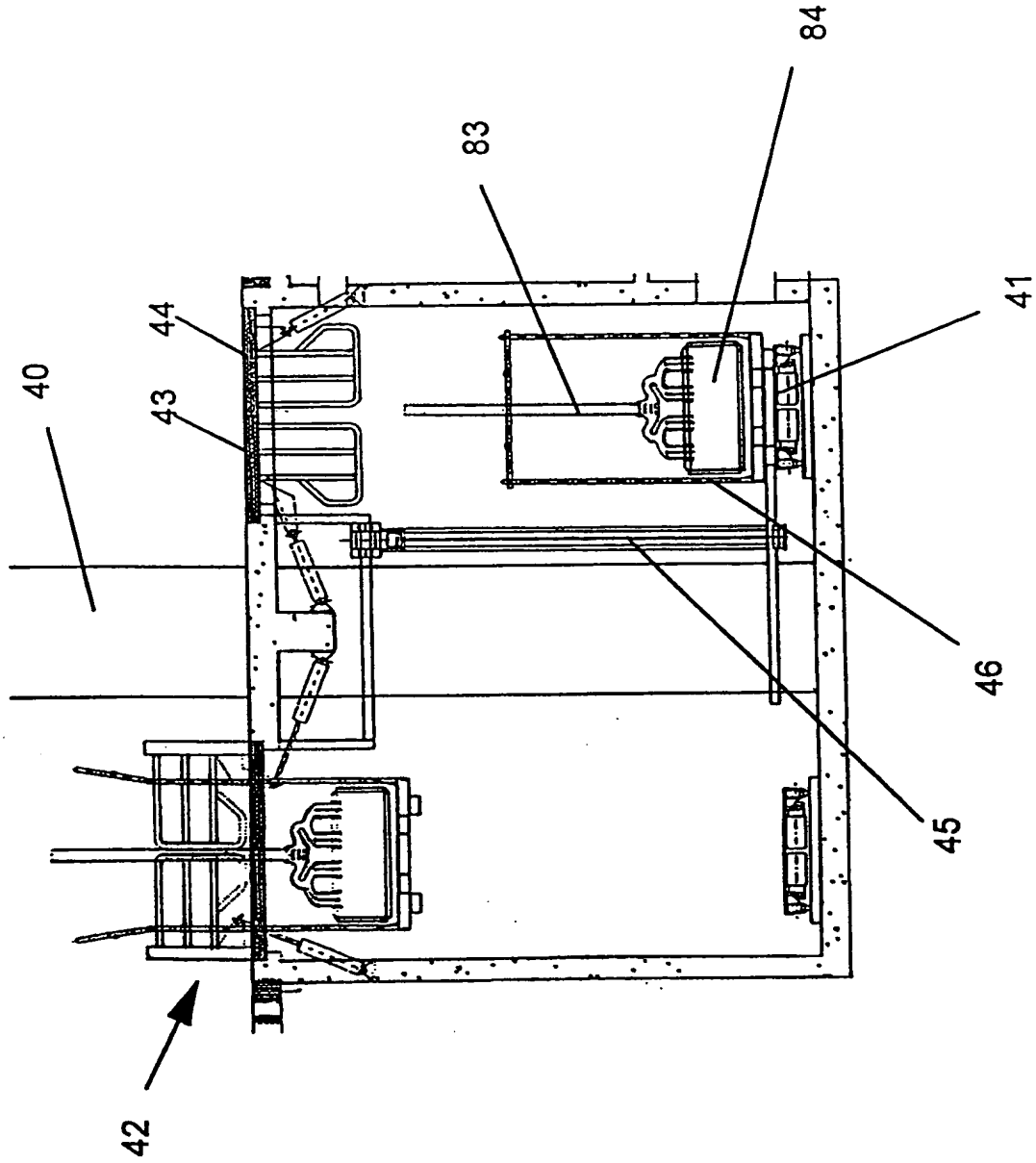

Fig. 2

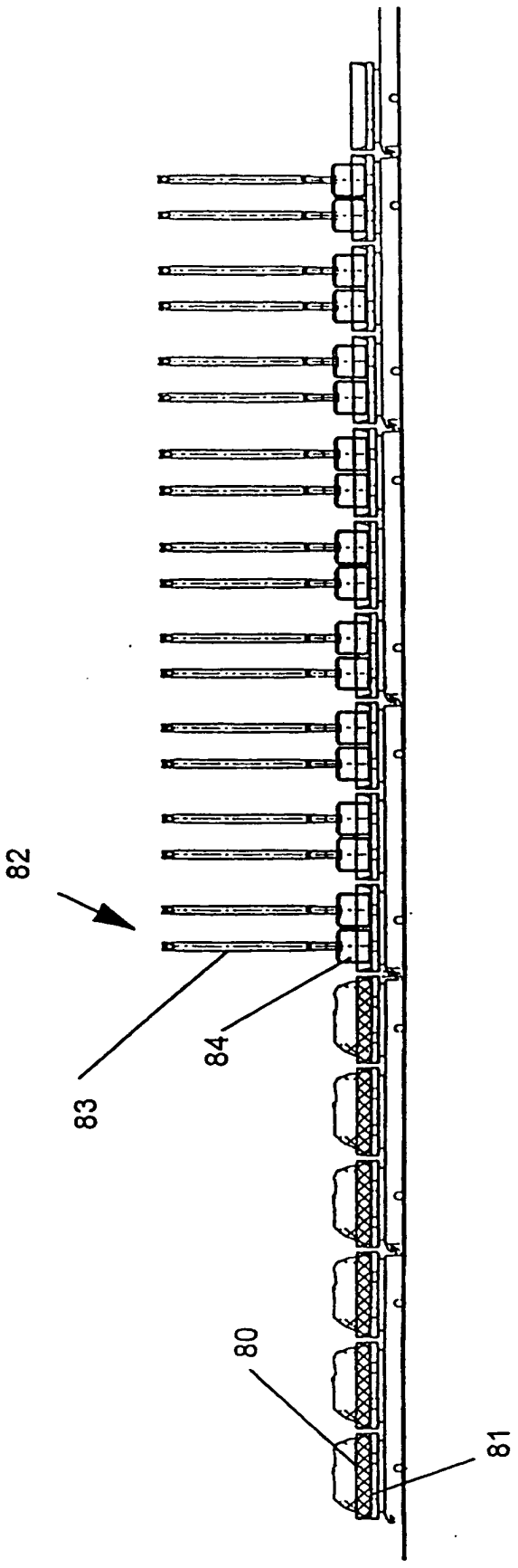

Fig. 3

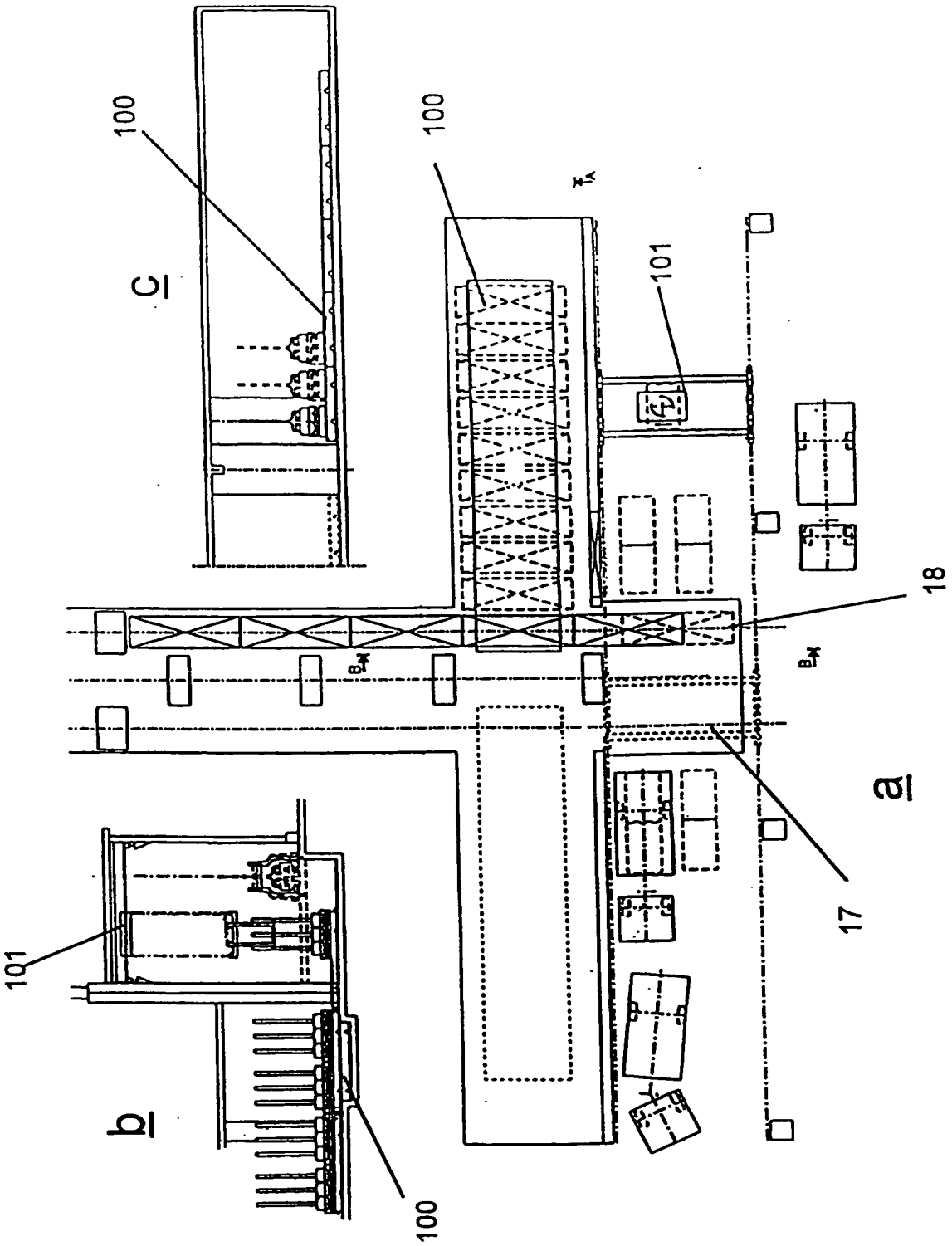

Fig. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 99/00021

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: C25C 7/06
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: C25C, F27D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5182869 A (ERWIN COLLET ET AL), 2 February 1993 (02.02.93), column 1, line 10 - column 3, line 50 --	1,3
A	US 4414825 A (JOACHIM GITTELBAUER), 15 November 1983 (15.11.83), column 2, line 20 - line 25, abstract --	1,3
A	EP 0324631 A1 (NORSK HYDRO A/S), 19 July 1989 (19.07.89) --	1,3
A	EP 0618313 A2 (TECHNO CAR S.P.A.), 5 October 1994 (05.10.94), abstract --	1,3

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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International application No.
PCT/NO 99/00021

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